Radar Signal Analysis And Processing Using Matlab

Time-Frequency Signal Analysis and Processing (TFSAP) is a collection of theory and algorithms used for the analysis and processing of non-stationary signals, as found in a wide range of applications including telecommunications, radar, and biomedical engineering. This book gives the university researcher and R&D engineer insight into how to use TFSAP methods to develop the engineering application systems they are looking to implement. A comprehensive tutorial introduction to Time-Frequency Signal Analysis and Processing TFSAP, accessible to anyone who has taken a first course in signals and systems; Key theory and algorithms, concisely presented by some of the leading authorities on the respective topics Applications, written by leading researchers, showing how to use TFSAP methods to develop Availability of a software package on TFSAP which consists of the most important algorithms described in the book so that they are ready for use with an easy GUi (Graphic User Interface). New sections on Efficient Fast Algorithms and a section "Getting Started" which allows users to start using the algorithms on simulated and real examples, compare the results presented in the book and then insert the algorithms in their own application and adapt as needed (Source code is provided) Two new chapters, 23 new sections, all sections include the latest references. New topics in this edition include: Efficient algorithms (with source code), the EMD, the S transform, time-frequency modelling, more mathematical foundations, relationship between QTFDs and Wavelet Transforms; new advanced applications such as cognitive radio; watermarking; noise reduction in the time-frequency domain; a time-frequency approach for spike detection; algorithms for Time-Frequency Image Processing; a full new chapter dedicated to Time-Frequency applications in neuroscience; a practical new chapter to help new users get started.

An essential task in radar systems is to find an appropriate solution to the problems related to robust signal processing and the definition of signal parameters. Signal Processing in Radar Systems addresses robust signal processing problems in complex radar systems and digital signal processing subsystems. It also tackles the important issue of defining signal parameters. The book presents problems related to traditional methods of synthesis and analysis of the main digital signal processing operations. It also examines problems related to modern methods of robust signal processing in noise, with a focus on the generalized approach to signal processing in noise under coherent filtering. In addition, the book puts forth a new problem statement and new methods to solve problems of adaptation and control by functioning processes. Taking a systems approach to designing complex radar systems, it offers readers guidance in solving optimization problems. Organized into three parts, the book first discusses the main design principles of the modern robust digital signal processing algorithms used in complex radar systems. The second part covers the main principles of computer system design for these algorithms and provides real-world examples of systems. The third part deals with experimental measurements of the main statistical parameters of stochastic processes. It also defines their estimations for robust signal processing in complex radar systems. Written by an internationally recognized professor and expert in signal processing, this book summarizes investigations carried out over the past 30 years. It supplies practitioners, researchers, and students with general principles for designing the robust digital signal processing algorithms employed by complex radar systems.

Signal Processing for Multistatic Radar Systems: Adaptive Waveform Selection, Optimal Geometries and Pseudolinear Tracking Algorithms addresses three important aspects of signal processing for multistatic radar systems, including adaptive waveform selection, optimal geometries and pseudolinear tracking algorithms. A key theme of the book is performance optimization for multistatic target tracking and localization via waveform adaptation, geometry optimization and tracking algorithm design. Chapters contain detailed mathematical derivations and algorithmic development that are accompanied by simulation examples and associated MATLAB codes. This book is an ideal resource for university researchers and industry engineers in radar, radar signal processing and communications engineering. Develops waveform selection algorithms in a multistatic radar setting to optimize target tracking performance Assesses the optimality of a given target-sensor geometry and designs optimal geometries for target localization using mobile sensors Gives an understanding of low-complexity and high-performance pseudolinear estimation algorithms for target localization and tracking in multistatic radar systems Contains the MATLAB codes for the examples used in the book

The first book to present a systematic and coherent picture of MIMO radars Due to its potential to improve target detection and discrimination capability, Multiple-Input and Multiple-Output (MIMO) radar has generated significant attention and widespread interest in academia, industry, government labs, and funding agencies. This important new work fills the need for a comprehensive treatment of this emerging field. Edited and authored by leading researchers in the field of MIMO radar research, this book introduces recent developments in the area of MIMO radar to stimulate new concepts, theories, and applications of the topic, and to foster further cross-fertilization of ideas with MIMO communications. Topical coverage includes: Adaptive MIMO radar Beampattern analysis and optimization for MIMO radar MIMO radar for target detection, parameter estimation, tracking,association, and recognition MIMO radar prototypes and measurements Space-time codes for MIMO radar Statistical MIMO radar Waveform design for MIMO radar Written in an easy-to-follow tutorial style, MIMO Radar Signal Processing serves as an excellent course book for graduate students and a valuable reference for researchers in academia and industry.

Academic Press Library in Signal Processing
Theory and Implementation for Radar, Sonar, and Medical Imaging Real Time Systems
Signal Processing in Radar Systems
Communications and Radar Signal Processing
A Comprehensive Reference

Discover the technology for the next generation of radar systems Here is the first book that brings together the key concepts essential for the application of Knowledge Based Systems (KBS) to radar detection, tracking, classification, and scheduling. The book highlights the latest advances in both KBS and radar signal and data processing, presenting a range of perspectives and innovative results that have set the stage for the next generation of adaptive radar systems. The book begins with a chapter introducing the concept of Knowledge Based (KB) radar. The remaining nine chapters focus on current developments and recent applications of KB concepts to specific radar functions. Among the key topics explored are: Fundamentals of relevant KB techniques KB solutions as they apply to the general radar problem KBS applications for the constant false-alarm rate processor KB control for space-time adaptive processing KB techniques applied to existing radar systems Integrated end-to-end radar Signals Data processing with overarching KB control All chapters are self-contained, enabling readers to focus on those topics of greatest interest. Each one begins with introductory remarks, moves on to detailed discussions and analysis, and ends with a list of references. Throughout the presentation, the authors offer examples of how KBS works and how it can dramatically improve radar performance and capability. Moreover, the authors forecast the impact of KB technology on future systems, including important civilian, military, and homeland defense applications. With chapters contributed by leading international researchers and pioneers in the field, this text is recommended for both students and professionals in radar and sonar detection, tracking, and classification and radar resource management. Time-Frequency Signal Analysis and Processing (TFSAP) is a collection of theory, techniques and algorithms used for the analysis and processing of non-stationary signals, as found in a wide range of applications including telecommunications, radar, and biomedical engineering. This book gives the university researcher and R&D engineer insights into how to use TFSAP methods to develop and implement the engineering application systems they require. New to this edition: New sections on Efficient and Fast Algorithms; a "Getting Started" chapter enabling readers to start using the algorithms on simulated and real examples with the TFSAP toolbox, compare the results with the ones presented in the book and then insert the algorithms in their own applications and adapt them as needed. Two new chapters and twenty three new sections, including updated references. New topics include: efficient algorithms for optimal TFDs (with source code), the enhanced spectrogram, time-frequency modelling, more mathematical foundations, the relationships between QTFDs and Wavelet Transforms, new advanced applications such as cognitive radio, watermarking, noise reduction in the time-frequency domain, algorithms for Time-Frequency Image Processing, and Time-Frequency applications in neuroscience (new chapter). A comprehensive tutorial introduction to Time-Frequency Signal Analysis and Processing (TFSAP), accessible to anyone who has taken a first course in signals Key advances in theory, methodology and algorithms, are concisely presented by some of the leading authorities on the respective topics Applications written by leading researchers showing how to use TFSAP methods

The 2nd Edition of this popular textbook is a major revision. It is written within the context of communication theory as well as the theory of signals and noise. Part I bridges the gap between communication theory, signals and noise and radar system analysis. Part II is on radar subsystems and associated topics and includes most common radar signal processing techniques, the theory of radar detection, coherent and non-coherent integration, and radar clutter analysis. Part III of this Edition will analyze special topics in radar systems. Many new exercises are included and the author provides comprehensive easy to follow mathematical derivations of all key equations and formulas.

The report deals primarily with various doppler signal processing techniques for the Porcupine Weather Radar System. Continuing emphasis is placed on digital data reduction techniques including the fast Fourier transform method of spectral analysis. Practical methods of handling the vast amounts of data gathered by the Coherent Memory filter are discussed. Initial work on the computer analysis of the Velocity Azimuth Display including program documentation is also included. (Author).

Advanced Signal Processing Handbook
Time-Frequency Signal Analysis and Processing

Topics in Radar Signal Processing
Fundamentals of Radar Signal Processing

Radar has been an important topic since its introduction, in a military context, during World War II. Due to advances in technology, it has been necessary to refine the algorithms employed within the signal processing architecture. Hence, this book provides a series of chapters examining some topics in modern radar signal processing. These include synthetic aperture radar, multiple-input multiple-output radar, as well as a series of chapters examining other key issues relevant to the central theme of the book.

Offering radar-related software for the analysis and design of radar waveform and signal processing, Radar Signal Analysis and Processing Using MATLAB® provides a comprehensive source of theoretical and practical information on radar signals, signal analysis, and radar signal processing with companion MATLAB® code. After an overview of radar systems operation and design, the book reviews elements of signal theory relevant to radar detection and radar signal processing, along with random variables and processes. The author then presents the unique characteristic of the matched filter and develops a general formula for the output of the matched filter that is valid for any waveform. He analyzes several analog waveforms, including the linear frequency modulation pulse and stepped frequency waveforms, as well as unmodulated pulse-train, binary, polyphase, and frequency codes. The book explores radar target detection and pulse integration, emphasizing the constant false alarm rate. It also covers the stretch processor, the moving target indicator, radar Doppler processing, beamforming, and adaptive array processing. Using configurable MATLAB code, this book demonstrates how to apply signal processing to radar applications. It includes many examples and problems to illustrate the practical application of the theory.

High-Resolution and Robust Signal Processing describes key methodological and theoretical advances achieved in this domain over the last twenty years, placing emphasis on modern developments and recent research pursuits. Applications-grounded, this sophisticated resource links theoretical background with high-resolution methods used in wireless communications, brain signal analysis, and space-time radar processing. Chapter extras include theorem proofs, derivations, and computational shortcuts, as well as open problems, numerical measurement, and performance examples, and simulation results Sixteen illustrious field leaders invest High-Resolution and Robust Signal Processing with: in-depth reviews of parametric high-resolution estimation and detection techniques; robust array processing solutions for adaptive beam forming and high-resolution direction finding; Parafac techniques for high-resolution array processing and specific areas of application; high-resolution nonparametric methods and implementation tactics for spectral analysis; multidimensional high-resolution data models and discussion of R-D unitary ESPRIT with colored noise; multidimensional high-resolution parameter estimation techniques applicable to channel sounding; estimation procedures for high-resolution space-time radar signal processing using 2-D or 1-D/1-D models; and models and methods for EEG/MEG space-time dipole source estimation and sensory array design.

This new handbook on radar signal analysis adopts a deliberate and systematic approach. It uses a clear and consistent level of delivery while maintaining strong and easy-to-follow mathematical details. The emphasis of this book is on radar signal types and their relevant signal processing and not on radar systems hardware or components. This handbook serves as a valuable reference to a wide range of audience. More specifically, college-level students, practicing radar engineers, as well as casual readers of the subject are the intended target audience of the first few chapters of this book. As the book chapters progress, these grow in complexity and specificity. Accordingly, later chapters are intended for practicing engineers, graduate college students, and advanced readers. Finally, the last few chapters contain several special topics on radar systems that are both educational and scientifically entertaining to all readers. The presentation of topics in this handbook takes the reader on a scientific journey whose major landmarks comprise the different radar subsystems and components. In this context, the chapters follow the radar signal along this journey from its birth to the end of its life. Along the way, the different relevant radar subsystems are analyzed and discussed in great detail. The chapter contributors of this new handbook comprise experienced academia members and practicing radar engineers. Their combined years of academic and real-world experiences are in excess of 175. Together, they bring a unique, easy-to-follow mix of mathematical and practical presentations of the topics discussed in this book. See the "Chapter Contributors" section to learn more about these individuals.

Signal Processing Algorithms for Communication and Radar Systems
Modulation, Resolution and Signal Processing in Radar, Sonar and Related Systems
Radar Interferometry
International Series of Monographs in Electronics and Instrumentation
Radar Networks

This cutting-edge resource introduces the basic concepts of passive bistatic radar, such as bistatic geometry, bistatic radar equation and analysis of different illuminating signals. These techniques, although known for almost a century, have not been developed intensively for decades, mainly due to technical limitations, but today, the passive radar concept can be realized in practice, and is of great interest for military and civilian users. This book provides insight into understanding the potential and limitations of passive radar systems, as well as the differences between signal processing in active and passive radar. Each of the signal processing stages typically applied in passive radar is described, including digital beamforming, clutter removal, target detection, localization and tracking. These concepts are illustrated with both simulated and measured data along with examples of passive radar systems. Correlation processing, which is crucial for passive radar operation, is presented, as well as practical approaches for calculating the cross-ambiguity function. The problems of range and velocity-cell migration are also introduced. The book analyzes and compares different antenna array geometries to show readers the appropriate solution for a particular scenario of passive radar. Cartesian tracking is also presented, based on the extended Kalman filter. Parallel and sequential updating approaches are introduced and compared. These concepts are illustrated with both simulated and measured data along with examples of passive radar systems, making this book useful for both novice and advanced practitioners.

An up-to-date analysis of the SAR wavefront reconstruction signal theory and its digital implementation With the advent of fast computing and digital information processing techniques, synthetic aperture radar (SAR) technology has become both more powerful and more accurate. Synthetic Aperture Radar Signal Processing with MATLAB Algorithms addresses these recent developments, providing a complete, up-to-date analysis of SAR and its associated digital signal processing algorithms. This book introduces the wavefront reconstruction signal theory that underlies the best SAR imaging methods and provides clear guidelines to system design, implementation, and applications in diverse areas-from airborne reconnaissance to topographic imaging of ocean floors to surveillance and air traffic control to medical imaging techniques, and numerous others. Enabling professionals in radar signal and image processing to use synthetic aperture technology to its fullest potential, this work: * Includes M-files to supplement this book that can be retrieved from The MathWorks anonymous FTP server at ftp://ftp.mathworks.com/pub/books/soumekh * Provides practical examples and results from real SAR, ISAR, and CSAR databases * Outlines unique properties of the SAR signal that cannot be found in other information processing systems * Examines spotlight SAR, stripmap SAR, circular SAR, and monopulse SAR modalities * Discusses classical SAR processing issues such as motion compensation and radar calibration

The subject of this book is theory, principles and methods used in radar algorithm development with a special focus on automotive radar signal processing. In the automotive industry, autonomous driving is currently a hot topic that leads to numerous applications for both safety and driving comfort. It is estimated that full autonomous driving will be realized in the next twenty to thirty years and one of the enabling technologies is radar sensing. This book presents both detection and tracking topics specifically for automotive radar processing. It provides illustrations, figures and tables for the reader to quickly grasp the concepts and start working on practical solutions. The complete and comprehensive coverage of the topic provides both professionals and newcomers with all the essential methods and tools required to successfully implement and evaluate automotive radar processing algorithms.

Radar Signal Processing and Its Applications brings together in one place important contributions and up-to-date research results in this fast-moving area. In twelve selected chapters, it describes the latest advances in architectures, design methods, and applications of radar signal processing. The contributors to this work were selected from the leading researchers and practitioners in the field. This work, originally published as Volume 14, Numbers 1-3 of the journal, Multidimensional Systems and Signal Processing, will be valuable to anyone working or researching in the field of radar signal processing. It serves as an excellent reference, providing insight into some of the most challenging issues being examined today.

Principles of Radar and Sonar Signal Processing
Window Functions and Their Applications in Signal Processing
Radar Signals
An Introduction to Theory and Application
Handbook of Radar Signal Analysis

Advances in digital signal processing algorithms and computer technology have combined to produce real-time systems with capabilities far beyond those of just few years ago. Nonlinear, adaptive methods for signal processing have emerged to provide better array gain performance, however, they lack the robustness of conventional algorithms. The challenge remains to develop a concept that exploits the advantages of both-a scheme that integrates these methods in practical, real-time systems. The Advanced Signal Processing Handbook helps you meet that challenge. Beyond offering an outstanding introduction to the principles and applications of advanced signal processing, it develops a generic processing structure that takes advantage of the similarities that exist among radar, sonar, and medical imaging systems and integrates conventional and nonlinear processing schemes.

This second volume, edited and authored by world leading experts, gives a review of the principles, methods and techniques of important and emerging research topics and technologies in communications and radar engineering. With this reference source you will: Quickly grasp a new area of research Understand the underlying principles of a topic and its application Ascertain how a topic relates to other areas and learn of the research issues yet to be resolved Quick tutorial reviews of important and emerging topics of research in array and statistical signal processing Presents core principles and shows their application Reference content on core principles, technologies, algorithms and applications Comprehensive references to journal articles and other literature on which to build further, more specific and detailed knowledge Edited by leading people in the field who, through their reputation, have been able to commission experts to write on a particular topic

Advances in DSP (digital signal processing) have radically altered the design and usage of radar systems -- making it essential for both working engineers as well as students to master DSP techniques. This text, which evolved from the author's own teaching, offers a rigorous, in-depth introduction to today's complex radar DSP technologies. Contents: Introduction to Radar Systems * Signal Models * Sampling and Quantization of Pulsed Radar Signals * Radar Waveforms * Pulse Compression Waveforms * Doppler Processing * Detection Fundamentals * Constant False Alarm Rate (CFAR) Detection * Introduction to Synthetic Aperture Imaging

This highly-anticipated second edition of an Artech House classic covers several key radar analysis areas: the radar range equation, detection theory, ambiguity functions, waveforms, antennas, active arrays, receivers and signal processors, CFAR and chaff analysis. Readers will be able to predict the detection performance of a radar system using the radar range equation, its various parameters, matched filter theory, and Swerling target models. The performance of various signal processors, single pulse, pulsed Doppler, LFM, NLFM, and BPSK, are discussed, taking into account factors including MTI processing, integration gain, weighting loss and straddling loss. The details of radar analysis are covered from a mathematical perspective, with in-depth breakdowns of radar performance in the presence of clutter. Readers will be able to determine the nose temperature of a multi-channel receiver as it is used in active arrays. With the addition of three new chapters on moving target detectors, inverse synthetic aperture radar (ISAR) and constant false alarm rate (CFAR) and new MATLAB codes, this expanded second edition will appeal to the novice as well as the experienced practitioner.

Radar Signal Analysis and Processing Using MATLAB
Basic Radar Analysis, Second Edition
A Comprehensive Review
Adaptive Waveform Selection, Optimal Geometries and Pseudolinear Tracking Algorithms
Signal Processing for Passive Bistatic Radar

A self-contained approach to DSP techniques and applications in radar imaging The processing of radar images, in general, consists of three major fields: Digital Signal Processing (DSP); antenna and radar operation; and algorithms used to process the radar images. This book brings together material from these different areas to allow readers to gain a thorough understanding of how radar images are processed. The book is divided into three main parts and covers: * DSP principles and signal characteristics in both analog and digital domains, advanced signal sampling, and interpolation techniques * Antenna theory (Maxwell equation, radiation field from dipole, and linear phased array), radar fundamentals, radar modulation, and target-detection techniques (continuous wave, pulsed Linear Frequency Modulation, and stepped Frequency Modulation) * Properties of radar images, algorithms used for radar image processing, simulation examples, and results of satellite image files processed by Range-Doppler and Stolt interpolation algorithms The book fully utilizes the computing and graphical capability of MATLAB? to display the signals at various processing stages in 3D and/or cross-sectional views. Additionally, the text is complemented with flowcharts and system block diagrams to aid in readers'

comprehension. Digital Signal Processing Techniques and Applications in Radar Image Processing serves as an ideal textbook for graduate students and practicing engineers who wish to gain firsthand experience in applying DSP principles and technologies to radar imaging.

Fourier transforms are used widely, and are of particular value in the analysis of single functions and combinations of functions found in radar and signal processing. Still, many problems that could have been tackled by using Fourier transforms may have gone unsolved because they require integration that is difficult and tedious. This newly revised and expanded edition of a classic Artech House book provides you with an up-to-date, coordinated system for performing Fourier transforms on a wide variety of functions. Along numerous updates throughout the book, the Second Edition includes a critical new chapter on periodic waveforms a topic not covered in any other book and detailed coverage of asymmetric triangular pulse. By building upon Woodward's well known "Rules and Pairs" method and related concepts and procedures, this book establishes a unified system that makes implicit the integration required for performing Fourier transforms on a wide variety of functions. It details how complex functions can be broken down to their constituent parts for analysis. You can now concentrate on functional relationships instead of getting bogged down in the details of integration. This approach to implementing Fourier transforms is illustrated with many specific examples from digital signal processing as well as radar and antenna operation. DVD-ROM Included! Contains MATLAB programs that implement many of the results presented in the book.

This book is the product of five and a half years of research dedicated to the und- standing of radar interferometry, a relatively new space-geodetic technique for m- suring the earth's topography and its deformation. The main reason for undertaking this work, early 1995, was the fact that this technique proved to be extremely useful for wide-scale, fine-resolution deformation measurements. Especially the interf- ometric products from the ERS-1 satellite provided beautiful first results—several interferometric images appeared as highlights on the cover of journals such as Nature and Science. Accuracies of a few millimeters in the radar line of sight were claimed in semi-continuous image data acquired globally, irrespective of cloud cover or solar illumination. Unfortunately, because of the relative lack of supportive observations at these resolutions and accuracies, validation of the precision and reliability of the results remained an issue of concern. From a geodetic point of view, several survey techniques are commonly available to measure a specific geophysical phenomenon. To make an optimal choice between these techniques it is important to have a uniform and quantitative approach for describing the errors and how these errors propagate to the estimated parameters. In this context, the research described in this book was initiated. It describes issues involved with different types of errors, induced by the sensor, the data processing, satellite positioning accuracy, atmospheric propagation, and scattering character- tics. Nevertheless, as the first item in the subtitle "Data Interpretation and Error Analysis" suggests, data interpretation is not always straightforward.

"This new handbook on radar signal analysis adopted a deliberate and systematic approach. It uses a clear and consistent level of delivery while maintaining strong and easy to follow mathematical details. The emphasis of this book is on radar signal types and their relevant signal processing and not on radar systems hardware or components. This handbook serves as a valuable reference to a wide range of audience. More specifically, college level students, practicing radar engineers, as well as casual readers of the subject are the intended target audience of the first few chapters of this book. As the book chapters progress, these grow in complexity and specificity. Accordingly, later chapters are intended for practicing engineers, graduate college students, and advanced readers. Finally, the last few chapters contain several special topics on radar systems that are both educational and scientifically entertaining to all readers. The presentation of topics in this handbook takes the reader on a scientific journey whose major landmarks comprise the different radar sub-systems and components. In this context, the chapters of this book follow the radar signal along this journey from its birth to the end of its life. Along the way, the different relevant radar subsystems are analyzed and discussed in great level of details. The chapter-contributors of this new handbook comprise well-seasoned academia members and practicing radar engineers. Their combined years of academic and real-world experiences are well in excess of 175 years. They together bring a unique easy to follow mix of mathematical and practical presentations of the topics discussed in this book. See "Chapter Contributors" section of this book to learn more about these individuals"--

Radar Signal Processing for Autonomous Driving
Synthetic Aperture Radar Signal Processing with MATLAB Algorithms
Signal Processing of Airborne Radar Stations
Digital Signal Processing Techniques and Applications in Radar Image Processing
Time-Frequency Signal Analysis with Applications

The first edition of this ground-breaking and widely used book introduced a comprehensive textbook on radar systems analysis and design providing hands-on experience facilitated by its companion MATLAB® software. The book very quickly turned into a bestseller. Based on feedback provided by several users and drawing from the author's own teaching experience, the 4th edition adopts a new approach. The presentation in this edition takes the reader on a scientific journey whose major landmarks comprise the different radar sub-systems and components. Along the way, the different relevant radar subsystems are analyzed and discussed in great level of detail. Understanding the radar signal types and their associated radar signal processing techniques are key to understating how radar systems function. Each chapter provides the necessary mathematical and analytical coverage required for a sound understanding of radar theory. Additionally, dedicated MATLAB® functions/programs enhance the understanding of the theory and establish a means to perform radar system analysis and design trades. The software provides users with numerous varieties of graphical outputs. Additionally, a complete set of MATLAB® code that generates all plot and graphs found within the pages of this textbook are also available. All companion MATLAB® code can be downloaded from the book's web page. The 4th Edition: •Takes advantage of the new features offered by MATLAB® 2021 release •Brings the text to a current state of the art •Incorporates much of the feedback received from users using this book as a text and from practicing engineers; accordingly, several chapters have been rewritten •Presents unique topics not found in other books •Maintains a comprehensive and exhaustive presentation •Restructures the presentation to be more convenient for course use. •Provides a post-course reference for engineering students as they enter the field •Offers a companion solutions manual for instructors The 4th edition will serve as a valuable tool to students and radar engineers by helping them better analyze and understand the many topics of radar systems. This book is written primarily as a graduate-level textbook, although parts of it can be used as a senior level course. A companion solutions manual has been developed for use by instructors.

A text and general reference on the design and analysis of radar signals As radar technology evolves to encompass a growing spectrum of applications in military, aerospace, automotive, and other sectors, innovations in digital signal processing have risen to meet the demand. Presenting a long overdue, up-to-date, dedicated resource on radar signals, the authors fill a critical gap in radar technology literature. Radar Signals features in-depth coverage of the most prevalent classical and modern radar signals used today, as well as new signal concepts developed in recent years. Inclusion of key MATLAB software codes throughout the book demonstrates how they dramatically simplify the process of describing and analyzing complex signals. Topics covered include: * Matched filter and ambiguity function concepts * Basic radar signals, with both analytical and numerical analysis * Frequency modulated and phase-coded pulses * Complete discussion of band-limiting schemes * Coherent LFM pulse trains-the most popular radar signal * Diversity in pulse trains, including stepped frequency pulses * Continuous-wave signals * Multicarrier phase-coded signals Combining lucid explanation, preferred signal tables, MATLAB codes, and problem sets in each chapter, Radar Signals is an essential reference for professionals-and a systematic tutorial for any seeking to broaden their knowledge base in this dynamic field.

Electronics and Instrumentation, Volume 35: Modulation, Resolution and Signal Processing in Radar, Sonar and Related Systems presents the practical limitations and potentialities of advanced modulation systems. This book discusses the concepts and techniques in the radar context, but they are equally essential to sonar and to a wide range of signaling and data-processing applications, including seismology, radio astronomy, and band-spread communications. Organized into 15 chapters, this volume begins with an overview of the principal developments sought in pulse radar. This text then provides a discussion and analysis of a wide range of various modulation systems. Other chapters consider the intrinsic Doppler resolving power of a radar system. This book discusses as well the power illuminating a radar or sonar target that may be comprised of one or more discrete pulses. The final chapter deals with the transmitter-modulator circuits and valves. This book is a valuable resource for electronic engineers and scientists.

Synthetic Aperture Radar Processing simply and methodically presents principles and techniques of Synthetic Aperture Radar (SAR) image generation by analyzing its system transfer function. The text considers the full array of operation modes from strip to scan, emphasizes processing techniques, enabling the design of operational SAR codes. A simple example then follows. This book will be invaluable to all SAR scientists and engineers working in the field. It may be used as the basis for a course on SAR image generation or as a reference book on remote sensing. It contains a wide spectrum of information presented with clarity and rigor.

Plane Flight Control in Difficult Meteoconditions
以最大似然法和离散编码波形也被讨论，以及失真对匹配滤波信号的影响。
Signal Processing for Multistatic Radar Systems
Knowledge Based Radar Detection, Tracking and Classification
Adaptive Radar Signal Processing

This collaborative work presents the results of over twenty years of pioneering research by Professor Simon Haykin and his colleagues, dealing with the use of adaptive radar signal processing to account for the nonstationary nature of the environment. These results have profound implications for defense-related signal processing and remote sensing. References are provided in each chapter guiding the reader to the original research on which this book is based.

Radar networks are increasingly regarded as an efficient approach to enhancing radar capabilities in the face of popular anti-radar techniques and hostile operating environments. Reader-friendly and self-contained, this book provides a comprehensive overview of the latest radar networking technologies. The text addresses basic, relevant aspects of radar signal processing and statistical theories, including both civilian and military radar applications. It also discusses emerging topics that directly relate to networks, such as multiple-input–multiple-output (MIMO) radars, waveform design, and diversity via multiple transmitters. Other topics covered include target recognition and imaging using radar networks. Features Gives a comprehensive view of the latest radar network technologies Covers both civilian and military applications of radar Provides basic statistics and signal processing necessary for understanding radar networks Includes up-to-date information on MIMO radars Presents waveform design and diversity for radar networks with multiple transmitters

Radar Signals: An Introduction to Theory and Application introduces the reader to the basic theory and application of radar signals that are designated as large time-bandwidth or pulse-compression waveforms. Topics covered include matched filtering and pulse compression; optimum predetection processing; the radar ambiguity function; and the linear frequency modulation waveform and matched filter. Parameter estimation and discrete coded waveforms are also discussed, along with the effects of distortion on matched-filter signals. This book is comprised of 14 chapters and begins with an overview of the concepts and techniques of pulse compression matched filtering, with emphasis on coding source and decoding device. The discussion then turns to the derivation of the matched-filter properties in order to maximize the signal-to-noise ratio; analysis of radar ambiguity function using the principle of stationary phase; parameter estimation and the method of maximum likelihood; and measurement accuracies of matched-filter radar signals. Waveform design criteria for multiple and dense target environments are also considered. The final chapter describes a number of techniques for designing microwave dispersive delays. This monograph will be a useful resource for graduate students and practicing engineers in the field of radar system engineering.

An authoritative text covering the key topics, concepts and analytical tools needed to understand modern communication and radar systems. With numerous examples, exercises and computational results, it is an invaluable resource for graduate students in electrical and computer engineering, and practitioners in communications and radar engineering.

Radar Signal Processing and Its Applications
Time-frequency Transforms for Radar Imaging and Signal Analysis
MATLAB Simulations for Radar Systems Design
High-Resolution and Robust Signal Processing
MIMO Radar Signal Processing

Simulation is integral to the successful design of modern radar systems, and there is arguably no better software for this purpose than MATLAB. But software and the ability to use it does not guarantee success. One must also: Understand radar operations and design philosophy Know how to select the radar parameters to meet the design req

Window functions—otherwise known as weighting functions, tapering functions, or apodization functions—are mathematical functions that are zero-valued outside the chosen interval. They are well established as a vital part of digital signal processing. Window Functions and their Applications in Signal Processing presents an exhaustive and detailed account of window functions and their applications in signal processing, focusing on the areas of digital spectral analysis, design of FIR filters, pulse compression radar, and speech signal processing. Comprehensively reviewing previous research and recent developments, this book: Provides suggestions on how to choose a window function for particular applications Discusses Fourier analysis techniques and pitfalls in the computation of the DFT Introduces window functions in the continuous-time and discrete-time domains Considers two implementation strategies of window functions in the time- and frequency domain Explores well-known applications of window functions in the fields of radar, sonar, biomedical signal analysis, audio processing, and synthetic aperture radar

This resource introduces a new image formation algorithm based on time-frequency-transforms, showing its advantage over the more conventional Fourier-based image formation. Referenced with over 170 equations and 80 illustrations, the book presents new algorithms that help improve the result of radar imaging and signal processing.

This book highlights new methods and parametric algorithms for the digital coherent processing of signals in airborne radar systems located on air vehicles. Using the autoregressive (AR) model, it delivers more accurate danger assessments for flight in wind shear and atmospheric turbulence, while also suggesting how they could be implemented. Given its scope, the book is intended for technical experts whose work involves the development, production and operation of airborne radio-electronic systems.

Doppler Signal Analysis and Processing Techniques for Modified 'porcupine' C-band Pulse Doppler Radar
Data Interpretation and Error Analysis
Introduction to Radar Analysis, Second Edition
Synthetic Aperture Radar Processing
Radar Systems Analysis and Design Using MATLAB

"The culmination of more than twenty years of research, this authoritative resource provides you with a practical understanding of time-frequency signal analysis. The book offers in-depth coverage of critical concepts and principles, along with discussions on key applications in a wide range of signal processing areas, from communications and optics… to radar and biomedicine. Supported with over 140 illustrations and more than 1,700 equations, this detailed reference explores the topics you need to understand for your work in the field, such as Fourier analysis, linear time frequency representations, quadratic time-frequency distributions, higher order time-frequency representations, and analysis of non stationary noisy signals. This unique book also serves as an excellent text for courses in this area, featuring numerous examples and problems at the end of each chapter. "

Fourier Transforms in Radar and Signal Processing, Second Edition